

the adult, except for the colored tips to the black feathers. I am inclined to think, however, that eight, or at the most ten, days are sufficient for the change, instead of three years, as implied or stated in the quotations given above.

Immaturity in this species is therefore recognizable, especially by the presence of differently colored tips to the head feathers, which are more or less persistent until the birds moult again in July of the following year; there being, I have good reason to believe, but one moult a year in this species.

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## NOTES AND SONG-FLIGHT OF THE WOODCOCK (*PHILOHELA MINOR*).

BY WILLIAM BREWSTER.

IN 1891, Mr. Walter Faxon and I spent two evenings and one morning studying the notes and song-flight of the Woodcock, and the present article consists merely of a transcript of the memoranda made on these occasions,—viz., the evenings of April 7 and 13, and the morning of April 8, the locality being Lexington, Massachusetts.

*Lexington, Mass., April 7, 1891.*—Mr. Faxon found a Woodcock singing on the evenings of the 5th and 6th and the morning of the 7th on the top of a high hill near the village. I went there with him this evening, arriving at 6.25, when the bird was already peeping. There were seven song-flights and eight peeping spells in the next thirty-five minutes, the last peeping being unusually protracted and the bird, at its close, rising and flying off low down without singing, at precisely seven o'clock. At this time it was still rather light or, at least, not nearly so dark as the night afterwards became. The weather was cold with a strong northwest wind, the sky overcast. The *paaps* were uttered consecutively 31, 21, 37, 29, and 28 times, no counts being made during the first and last calling periods. The song proper (timed once only) lasted exactly ten seconds.

The song-flight (timed once) from start to finish, the bird being actually seen to leave the ground and to alight on his return, lasted just one minute. We watched the bird through several flights. He always sprang directly into the wind and flew nearly straight for about 100 yards, rising at a very slight angle with the ground. He then turned, sometimes to the right, sometimes to the left, and flew about 200 yards with the wind, curving slightly and mounting rapidly on this stretch especially near its end. The next stretch, a half spiral, carried him to the highest elevation, about 300 feet. He then described a rather large circle on a level plane and after this flew about irregularly in smaller, incomplete circles and broad spiral curves all of which inclined downward. Once he described a double curve nearly like the letter S. Although he was a strong and musical singer he did not pitch down on zigzag lines while singing like all the other birds that I have seen, but merely followed the gently sloping lines just described, his descent, during the song, being scarcely more steep than during the twittering which immediately preceded the song. He looked very bat-like, darting irresolutely about in the dusky sky. The song proper was interspersed with more or less twittering. At its close the bird shot down in the usual manner on set wings, flapping his wings a number of times to check his speed just before he reached the ground. Sometimes he would alight immediately after this flapping, sometimes skim close over the earth for several rods before finally settling.

By making a quick run while the bird was in the air I succeeded in reaching and crouching behind a small cedar on the edge of the opening where he usually alighted. He settled on the further edge of this within about fifty feet of me, and for a moment or two stood perfectly still. Then he uttered about twenty *paaps* without changing his position or taking a single step. Each *paap* was closely preceded by a *p't-ul*, so closely at times that the two sounds were nearly merged, suggesting that one of them might be mechanical! Sometimes two *p't-uls* preceded the *paap*.

The delivery of each *paap* was accompanied by an abrupt backward, followed by a forward and downward, jerk of the head and a slight opening of the wings. The bird did not turn about

as Mr. FAXON had seen him do on a former occasion, but after peeping about twenty times he made a crouching run of a few feet in a half circle. When he stopped he was lost to my sight behind a small bush. While under my observation I could not see him very distinctly, owing to the fact that the light was dim and on his further side, he being to the west of my position. After peeping a few times more he rose, flying off up wind, mounting at first very gently, in fact skimming close to the ground for the first twenty yards, but probably rising slightly during even this distance. During the remainder of the ascent he rose more and more steeply the further he proceeded. Mr. FAXON tells me that on the two preceding evenings, as on this, he closed by a long spell of peeping, and then flew off to cover or feeding ground.

*Lexington, Mass., April 8, 1891.*—Reached the hill-top at 4.25 this morning; sky overcast, wind northwest, moderate; cold, the ditches and shallow pools covered with ice as thick as window glass. The eastern sky was reddening but there seemed to be less daylight than when our bird ceased singing last night. Nevertheless he was already at his post, for we heard him rise and sing before we had climbed halfway up the hillside. During the next twenty-five minutes he sang nine times and at the close of the ninth song scaled directly over his peeping place down the hillside into a piece of birch cover where he doubtless spends the day. Mr. FAXON tells me that he ended in the same way yesterday morning, that is, by flying to cover without peeping. It was practically broad daylight during his last ascent and I saw this performance, as well as the two that preceded it, nearly or quite as distinctly as if it had been noonday. The bird rose and descended precisely as he did last evening, but once during the descent he made two rather steep pitches (while singing). His ascent was fairly regular but his descent decidedly irregular. He sang last evening and this morning over nearly the same spot. His total flight extended over a space of fully five acres. During his last descent this morning I followed him with my glass and made out *distinctly* that while singing he alternately flapped his wings (several times in succession) and held them extended and motionless. During one of the periods when they were not moving the song was at its height and the

bird was gliding down on a *very* gentle slope. Perhaps *floating* would be a more correct term than gliding, for the motion was comparatively slow. Towards the end of the song the descent was steeper and the bird slid down the sky like a meteor. The flight of this individual is evidently very erratic and subject to excessive variations. I ran to the peeping spot during the third ascent but the bird alighted where I could not see him, owing partly to the darkness, partly to intervening obstructions of brush or grass. The next two times he was equally unaccommodating although he chose different spots, both within thirty yards of me, on each return. I then made another run and crouched in the middle of a ground juniper. Fatal mistake! I could not move without making a loud rustle or crunching of dry twigs. It was too late to change again, however, for the next instant the bird shot close over my head and alighted directly behind me *not ten feet off*. I could hear his wings rustle as he closed them. An interval of silence, a *p't-ul*, and then the harsh *paap* smote on my ear with fairly painful effect. At this close range it had a strange, vibrating quality. It seemed to penetrate my brain as if some one had blown a blast on a fish horn within a foot of my head. Another and another *paap*, each preceded by the usual *p't-ul*. I now attempted to move, but a slight sound which I made caused the bird to cease peeping at once. Silence for several seconds; then the *p't-ul* repeated six or eight times doubtfully; then the peeping resumed. I did not move again and the bird finishing its peeping rose and sang, descending fifty yards away behind some bushes. The next song-flight was the last.

The *p't-ul* is, I believe (and Mr. Faxon confirms this), usually repeated many times in succession, *without* the alternating *paaps*, when the bird is slightly alarmed or suspicious. My old comparison of the *p't-ul* to the sound and its echo made by a drop of water falling into a cistern struck me again this evening. This note also somewhat resembles the remonstrance made by a brooding hen, when disturbed. It can be heard about eighty-five yards away under the most favorable conditions but ordinarily not beyond thirty or forty yards. The hill where this bird sings is one of the highest (340 feet) near Lexington (220 feet). Its summit is broken by alternating knolls and hollows

and is open pasture land with a few scattered red cedars and ground junipers and occasional patches of hazel bushes. The peeping ground is in a hollow on the edge of a hazel thicket. The bird usually alights in an opening where close-cropped turf (now of a bleached straw color) alternates with patches of gray reindeer moss or dark green pasture moss.

The entire space embraced in the peeping ground would not exceed half an acre. Mr. Faxon saw the bird alight several times, on the night of the 5th, in the same place, but last evening and this morning he chose a different spot each time. The entire peeping ground, as well as the whole top of the hill, is perfectly hard and dry. Three sides of the hill are covered with second growth oak and birch woods, which appear to be also dry beneath. At the base of the hill on two sides, however, the land is wet and swampy.

We searched the 'peeping ground' carefully for Woodcock droppings but could find no trace of them. On April 11, Mr. Faxon searched it again without discovering a single 'chalking.'

*Lexington, Mass., April, 13, 1891.*—To the hill with Mr. Faxon at 6.30 P. M. Evening clear and warm (thermometer 60° at sunset, 62° at noon) with light west wind changing to southwest just after sunset. The Woodcock began peeping at 6.44. ('Last night he began at 6.30 and night before last at 6.40, both of these evenings being cloudy.'—*Faxon.*) He continued peeping nine minutes before making his first ascent, and made in all six ascents. ('Fifteen ascents were noted one evening last week.'—*Faxon.*) Two flights, which I timed from the start to the finish, lasted respectively 57 and 59 seconds, the song 11 and 12 seconds respectively. During the first ascent I ran to the peeping-place and sat down on the ground behind a large rock. The bird alighted on a little knoll covered with reindeer moss just nine paces from me. There was absolutely nothing between us, the rock being in front of me and the Woodcock on my right. For a moment he stood motionless and silent, then began peeping. I turned so as to face him, at the same time raising my glass. He evidently saw me, for he stopped peeping and uttered the *p't-ul* a number of times in succession, but soon after I had settled myself in the new position, he began peeping again and showed no further signs of alarm or suspicion. For

some time he stood facing the south, his right side turned squarely towards me, giving me a profile view. The light was still good and thrown directly upon him (he was to the east of my position). Through the glass I could distinctly see his color and markings, the large dark eye, the bill, feet—in short, every detail of form and plumage. In the intervals between the notes, his position, outline and the relative proportions of the different parts presented nothing peculiar. The body was held a little more erect than usual, the back rounded, the head raised, the bill inclined well downward, the tail depressed and closed, its tip just showing below the ends of the closed wings. There was no inflation of the throat, jugulum or breast, no ruffling of the plumage. In short, the bird looked in every way precisely like the conventional stuffed Woodcock that one sees in taxidermists' shops.

At each utterance of the *paap* the neck was slightly lengthened, the head was thrown upward and backward (much in the manner of a Least Flycatcher's while singing), the bill was opened wide and raised to a horizontal position, the wings were jerked out from the body. All these movements were abrupt and convulsive, indicating considerable muscular effort on the part of the bird. There was perhaps also a slight twitching of the tail, but this member was not perceptibly raised or expanded. The return of the several parts to their respective normal positions was quite as sudden as were the initial movements. The forward 'recovery' of the head was well marked. The opening and shutting of the bill strongly suggested that of a pair of tongs. During the emission of the *paap* the throat swelled and its plumage was ruffled but neither effect was more marked than with any of our small birds while in the act of singing.

The *p't-ul* note when closely followed by the *paap*, as was usually the case, was not accompanied by any of the movements just described but when, as occasionally happened, the bird repeated it several times without peeping, he moved his head and bill just as when peeping, but to a much less degree.

After a minute or two the Woodcock suddenly turned and, without changing his ground, took a position directly facing me. Viewed from in front the motions just described produced a somewhat different impression. The backward toss of the head

was no longer apparent, while the lengthening and shortening of the neck became more conspicuous. In fact the head now seemed to be bobbed up and down, much in the manner of an Owl's. The movement of the wings was more strongly marked, and its character and extent could be definitely traced. The wings were not spread or opened, but merely jerked out from the body spasmodically. The shoulders showed distinctly for an instant, but the primaries were at all times covered by the long overlapping feathers of the flanks and sides. These loose feathers moved out and in with the wings, giving the body the appearance of being laterally inflated and then contracted. The mouth opened to such an extent that I could look directly down the bird's throat, which appeared large enough to admit the end of one's forefinger. The lateral distention of the mouth was especially striking.

Wilson Flagg says (*Birds and Seasons in New England*, p. 333) that the Woodcock while peeping "may be seen strutting about like a Turkey-cock, with fantastic jerkings of the tail and a frequent turning of the head." Neither Mr. Faxon nor I have ever seen anything of the kind. On the contrary, one of the most marked features of the performance is the fact that the bird, when not in the act of uttering the sound, stands perfectly still, and always in about the same attitude. Our subject to-night did not once vary his attitude nor turn his head ever so slightly to one or the other side. It was not uncommon, however, for him to change his position after peeping a few times by turning partly around and facing in a different direction; and Mr. Faxon has repeatedly seen him move from place to place, over a space of a few square yards by quick, short runs, stopping to peep a number of times in succession on the top of each little mound that lay in his track and facing in different directions. Once to-night he faced all four quarters of the compass in succession, making a quarter turn each time without changing his ground. Each change of position produced a marked change in the sound of his voice. When his back was turned towards me, the *paap* sounded muffled and much more distant, while I could hardly hear the *p't-ul* at all. Mr. Faxon has seen him descend from the air to exactly the same spot three or four times in succession, but to-night he alighted in a different place after each flight,

possibly because he had seen me the first time. I had only one good view of him on the ground.

Mr. Faxon devoted his entire attention this evening to studying the aerial flight. His conclusions are that during the production of each set of musical (water-whistle) notes, the bird holds his wings extended and *set*, whether he be sailing or pitching down sharply at the time; and further that the wings invariably move rapidly and continuously in a whirring manner during the intermittent periods of twittering.

This morning Mr. Faxon found the bird already peeping at 4.15. He watched him through one peeping spell at a distance of fifteen feet (measured) from behind a small leafless bush.

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## BIRDS OF SOUTH-CENTRAL MONTANA.

BY CHAS. W. RICHMOND AND F. H. KNOWLTON.

THE observations recorded in this paper were confined almost entirely to Gallatin County, with short visits into the western part of Park County north of the Yellowstone National Park, and into the eastern portions of Madison and Jefferson Counties. The area embraced is about 75 miles in north and south direction, and 30 miles in east and west, or approximately 2500 square miles. It lies along the eastern flank of the Rocky Mountains, in the south-central portion of this great State. It is very much diversified, including the broad, fertile Gallatin Valley on the north with an altitude of only 4600 feet, the long, narrow Madison Valley on the west, the elevation of which is about 5000 feet, and the Gallatin and Madison ranges of mountains in the southern portion, with a general elevation of from 6000 to 9000 feet, with many peaks rising above 10,000 feet, and a few to over 11,000 feet. In the extreme northern portion of the area under discussion the three rivers—Gallatin, Madison and Jefferson—unite to form the headwaters of the Missouri. These streams all rise in the mountains far to the south and southwest, and hence flow approximately north. In their courses through the mountains they have in many places